Profile SFR-58

TESLA

LATVIA

GENERAL INFORMATION

NAME OF THE FACILITY	Experimental sodium loop (DN125mm)
ACRONYM	TESLA
COOLANT(S) OF THE FACILITY	Liquid sodium
LOCATION (address):	Institute of Physics University of Latvia (IPUL), Salaspils, Latvia ,LV-2169
OPERATOR	IPUL
CONTACT PERSON (name, address, institute, function, telephone, email):	Ernests Platacis, IPUL, Miera 32, Salaspils, Latvia LV-2169 Head of Hydro-mechanic Laboratory, Tel. +371 2651 3424, erik@sal.lv

STATUS OF THE FACILITY	In operation
Start of operation (date):	**2014**

MAIN RESEARCH FIELD(S)

- ☐ Zero power facility for V&V and licensing purposes
- x Design Basis Accidents (DBA) and Design Extended Conditions (DEC)
- x Thermal-hydraulics
- ☐ Coolant chemistry
- x Materials
- x Systems and components
- x Instrumentation & ISI&R

TECHNICAL DESCRIPTION

Description of the facility

The facility TESLA is a DN 125mm liquid sodium loop. The loop is placed in a SS plate lined 240 m^2 hall especially designed for exploratory development of liquid metal equipment. A good protected control room foreseen. The facility operates with an inventory of 350 L of sodium at temperatures up to 500°C. The loop contains two different test sections for thermo-hydraulic experiments, for engineering and operational development of components and instrumentation, for testing of different materials used in liquid sodium techniques. All components to be in contact with the liquid metal are made of stainless steel. The facility includes two storage tanks under argon cover gas, an expansion tank, a cold trap and a cooler.

All components equipped with electrical heaters and thermal insulation. The operating status of the facility is monitored by thermocouples, pressure gauges, a Venturi tube and an electromagnetic flow meter. For generation of the discharge pressure electromagnetic pumps are used.

Acceptance of radioactive material
No

Scheme/diagram

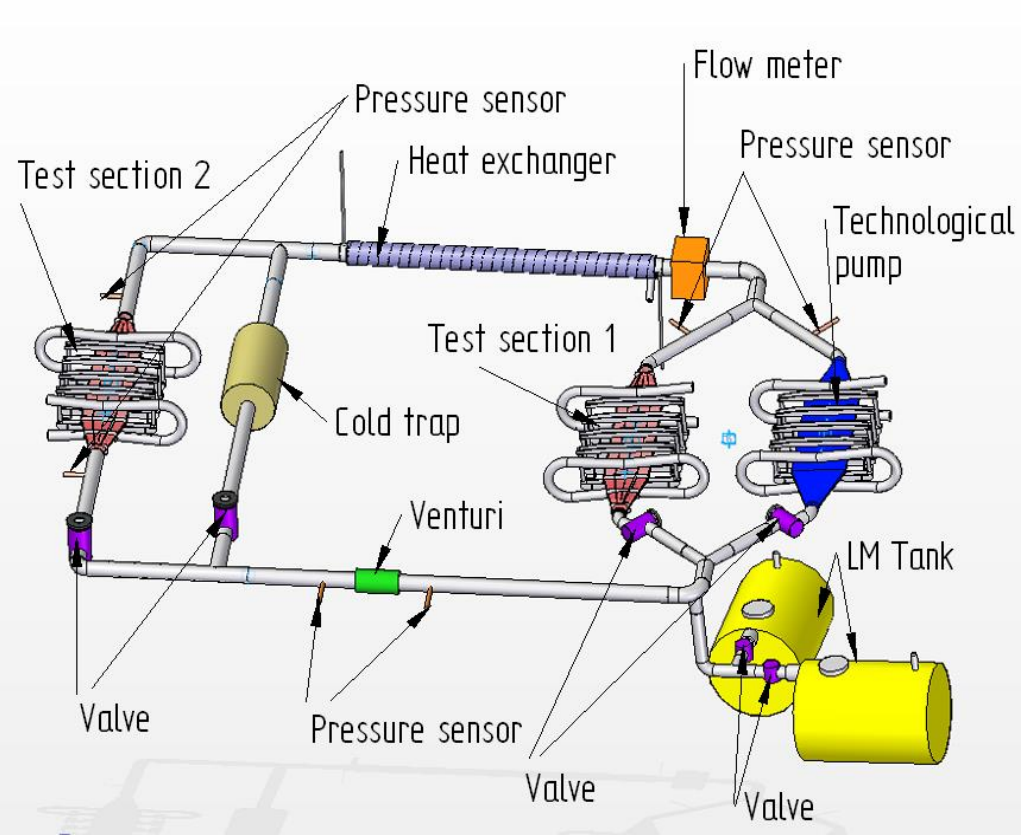

FIG. 1. Scheme of the sodium loop DN 125 "TESLA"

FIG. 2. View of the flat induction pump under investigation at TESLA (Q up to 70L/s; p =5bar)

3D drawing/photo

FIG. 3. View of the sodium loop DN 125 "TESLA"

Parameters table

Coolant inventory	Liquid sodium – 350 L
Hydraulic power (pxQ)	75 kW
Test sections	
TS 1 Traditional test section installed "in straight line" with the main loop TS#2 Test section for investigation of EM pumps installed in parallel.	*Characteristic dimensions* Length of the unit under test (distance between inlet / outlet flanges): T1-2.5 m; TS-2 -3m. Height over ground level -1.5m
	Static/dynamic experiment Static pressure, discharge pressure, pulsating pressure available.
	Temperature range in the test section Up to 500^0 C
	Operating pressure and design pressure TS1 - 3 bar; TS2 - 5bar
	Flow range (mass, velocity, etc.) TS1- 75L/s; TS2- 120L/s
Coolant chemistry measurement and control (active or not, measured	Liquid sodium; of coolant chemistry not controlled

parameters)	
Instrumentation	Remote measurements from the control room. Main sensors: thermocouples, including version when the sensing tips are immersed in Na ; pressure transducers, including version with a Na contacting membranes (direct electric output); home-made electromagnetic flow meters of different type; calibrated Venturi tube; dynamic cower gas pressure controlling system; local pine-type probes for measuring of electric potentials; complex system for magnetic measurements with Hall-type probes, small size coils, etc.;

COMPLETED EXPERIMENTAL CAMPAIGNS: MAIN RESULTS AND ACHIEVEMENTS

Completed campaign –preparatory steps for the investigation of instabilities in the channels of electromagnetic induction pumps.

The discharge parameters of the loop were defined; testing of measuring equipment performed; means for treatment of the results adapted.

PLANNED EXPERIMENTS (including time schedule)

1. Development of small velocity perturbations artificially introduced in the inlet part of the channel, investigation of the influence of the velocity and slip.
2. Definition of maximum achievable velocity, to approach the criterion of instability Re_m x slip$\geq$ 1 (Re_m – magnetic Re number)
3. Fail-safe operation of combined system of electromagnetic pumps.

TRAINING ACTIVITIES

Training activities should be agreed with IPUL for the operation of the experimental facilities under the supervision of IPUL qualified staff.

REFERENCES (*specification of availability and language*)

1. GOLDSTEINS L, BUCENIEKS I., BULIGINS L. " A simplified model of centrifugal electromagnetic pump with rotating permanent magnets;" Fundamental and applied MHD, Thermo acoustic and space technologies; The 9th Internal pamir conference; Volume 2; p.p. 33- 37, 2014.

2. GOLDSTEIN L., GAILITIS A., BULIGINS L., FAUTRELLE Y., BISCARRAT C. "Analitical Investigation of MHD instability in annular linear electromagnetic induction pump;" Fundamental and applied MHD, Thermo acoustic and space technologies; The 9th Internal pamir conference; Volume 2; p.p. 38- 43, 2014.

3. GOLDSTEINS L., FAUTRELLE Y., BISCART C., MIKANOVSKIS O., Platacis e., Poznaks A., Romanchuks A., Sobolevs A., Ziks., Buligins L." 125 mm sodium loop for scaled down 4-th generation nuclear reactor thermo-hydraulic equipment testing,"

Fundamental and applied MHD, Thermo Acoustic and Space Technologies; (The 9th International Pamir Conference, Riga); Volume 1; p.p. 51- 54, 2014